



IB MYP Year 5

Year 10 Extended Mathematics

Assessment #8



PATTERNS IN PROBABILITY

Unit Question: How do we remember what we have learned? Name: Kwok Chun Hei
 Area of Interaction: ATL Teachers: Ms. Li, Mr. So, and Mr. Wong
 Date: May 31, 2013 Time Allowed: Single Lesson
 Concept Statement: You will always find previous knowledge useful in future situations.
 The objective of this task is to find a pattern in probability in a table tennis game using knowledge from both this year and last year.

PREPARATION:

- ◆ From year 9, revise what you have learned about **probability**.
- ◆ From year 10, revise what you have learned about **sequences** and **series**.

INSTRUCTIONS:

- ◆ Show all **steps** and proper **units** on the **lined paper** provided.
- ◆ Submit **your own work**. Any copying or other cheating, will automatically receive a 0.
- ◆ You are allowed to use non-electronic **dictionary**.
- ◆ **Calculators** are allowed.

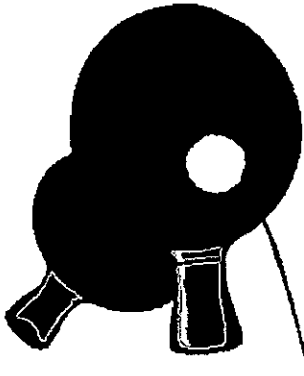
ASSESSMENT:

- ◆ Read **all the questions** first, then the **criteria descriptors** and **task-specific clarifications** carefully before you start your work. This will give you a clear understanding of what is required and what a high quality piece of work for this task must include. This way you give yourself the best chance of achieving the highest levels in this task.
- ◆ This task assesses Criterion B.

CRITERION B: INVESTIGATING PATTERNS

Achievement level	Task Specific Rubric	IBO Published Descriptor	Student's Self-Evaluation
0	The student does not reach a standard described by any of the descriptors given below.	The student does not reach a standard described by any of the descriptors given below.	3 (0-8)
1-2 Do Maths	You are able to answer the early questions, and order your answers in a way that reveals patterns.	The student applies, with some guidance, mathematical problem-solving techniques to recognize simple patterns.	
3-4 General Rule	You develop appropriate systematic methods in order to answer the questions. The results you get help you to suggest a mathematical rule using a, b and N.	The student applies mathematical problem-solving techniques to recognize patterns, and suggests relationships or general rules.	Teacher's Final Grade
5-6 Test it	You continue with the questions, and use questions 6 and 7 as a check on your findings.	The student selects and applies mathematical problem-solving techniques to recognize patterns, describes them as relationships or general rules, and draws conclusions consistent with findings.	(0-8)
7-8 Prove it	You are able to justify or prove your answer to question 6.	The student selects and applies mathematical problem-solving techniques to recognize patterns, describes them as relationships or general rules, draws the correct conclusions consistent with the correct findings, and provides justifications or proofs.	

PATTERNS IN PROBABILITY



I play table tennis against a friend. The probability I win a point is a and the probability she wins a point is b . These probabilities stay constant throughout the game.

(**Important Note:** $a \neq b$ While two table tennis players can have the same skill level, in general one player is better. This will be important in question 7.)

A game is won only when a player wins two consecutive points.

So, for example, I might win a game where the point rallies go: WLWLWLWW (that is, I win the game because I won the final 2 points).

In the following, simplify your answers wherever possible.

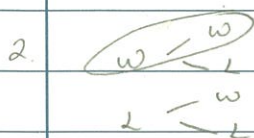
1. Write a simple relationship between a and b .
2. What is the probability I win the first two points (and so win the game)?
3. What is the probability the game lasts for 3 points and I win?
4. What is the probability the game lasts for 4 points and I win?

(You may like to repeat question 4 for when the game lasts for 5 points, or 6, or 7 and so on.)

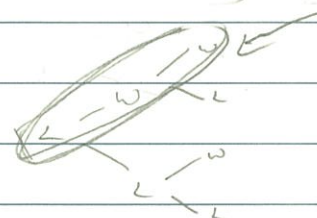
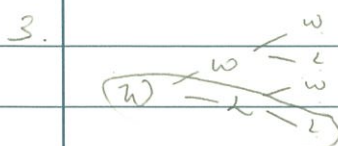
5. Describe mathematically any patterns you find in these probabilities.
6. What is the probability, in terms of a and b , that the game lasts for N points and I win?
7. If $a = 0.6$, show that the probability I win a game in 5 points or less is approximately 0.625.
8. Write a **proof** or **justification** of your answer to question 6.

~ End of Assessment ~

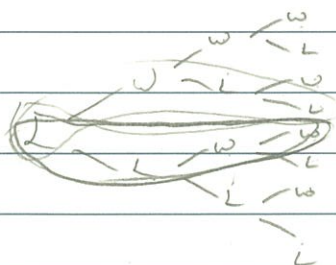
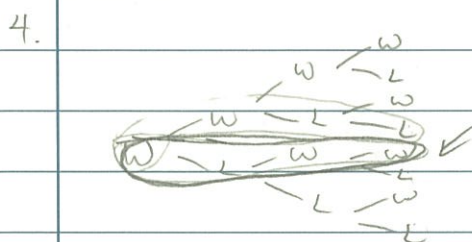
1. $a = 1-6$



$P(\text{winning first two points}) = \frac{1}{4}$



$P(\text{win on 3rd point}) = \frac{1}{8}$



$P(E) = \frac{1}{32}$

$P(\text{win on 4th point}) = \frac{1}{16}$

$$5. \quad T_2 = \frac{1}{4} = \frac{1}{2^2}$$

$$T_3 = \frac{1}{8} = \frac{1}{2^3}$$

$$T_4 = \frac{1}{16} = \frac{1}{2^4}$$

$$T_5 = \frac{1}{32} = \frac{1}{2^5}$$

General Rule: $T_n = 2^{-n}$

$$6. \quad p(I \text{ wins}) = a$$

$$p(\text{she wins}) = b$$

$$p(\text{lasts for } N \text{ points and I win}) = \frac{1}{a+1}$$

$$7. \quad \text{Sub. } a: 0.6 \text{ into } P(E) = \frac{1}{a+1}$$

$$P(E) = \frac{1}{0.6+1} = 0.625$$